

WHAT IS CLAIMED:

1. A platinum group metal-free (PGM-free) regenerable catalyst composition for entrapping SO_x , the
5 composition comprising a component having formula I;



wherein A oxide is selected from the group consisting of SiO_2 , Zr-SiO_2 , Al_2O_3 , $\text{TiO}_2\text{-Al}_2\text{O}_3$, ZrO_2 , In_2O_3 , and mixtures thereof.

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2. The platinum group metal-free regenerable catalyst of claim 1 wherein the Cu loading is from about 10 mol% to about 60 mol%.

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3. The platinum group metal-free regenerable catalyst of claim 1 wherein the Cu loading is about 25 mol%.

4. The platinum group metal-free regenerable catalyst composition of claim 1 wherein the A oxide is
20 selected from the group consisting of SiO_2 , Zr-SiO_2 , $\text{TiO}_2\text{-Al}_2\text{O}_3$, ZrO_2 , In_2O_3 , and mixtures thereof.

5. The platinum group metal-free regenerable catalyst composition of claim 1 wherein the A oxide is
25 selected from the group consisting of SiO_2 , Zr-SiO_2 , and mixtures thereof.

6. The platinum group metal-free regenerable catalyst composition of claim 1 wherein the A oxide comprises
30 SiO_2 .

7. The platinum group metal-free regenerable catalyst composition of claim 1 wherein the A oxide comprises Zr-SiO_2 .

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8. A method of adsorbing SO_x as metal sulfate in a temperature range of 200°C to 500°C under lean fuel conditions using the catalyst composition of claim 1.

5 9. A method of desorbing metal sulfates at a temperature range of 250°C to 450°C under rich fuel conditions using the catalyst composition of claim 1.

10 10. A platinum group metal free catalyst composition for entrapping SO_x , the catalyst composition comprising an oxide selected from the group consisting of praseodymia, zirconia-praseodymia and mixed manganese-yttria and mixtures thereof.

15 11. The catalyst composition of claim 10 comprising praseodymia.

12. The catalyst composition of claim 10 comprising zirconia-praseodymia.

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13. The catalyst composition of claim 10 comprising mixed manganese-yttria.

25 14. A method of adsorbing SO_x as metal sulfate in a temperature range of 200°C to 500°C under lean fuel conditions using the catalyst composition of claim 10.

30 15. A method of desorbing metal sulfates at a temperature range of 250°C to 450°C under rich fuel conditions using the catalyst composition of claim 10.

16. A vehicle exhaust system comprising:
a nitrogen oxide trap; and
a SO_x adsorbing component located upstream of the
35 nitrogen trap in the vehicle exhaust system, the SO_x

adsorbing material comprising a catalyst selected from the group consisting of:

a) a platinum group metal-free (PGM-free) regenerable catalyst composition for entrapping SO_x comprising a component having formula I;



wherein A oxide is selected from the group consisting of SiO₂, Zr-SiO₂, Al₂O₃, TiO₂-Al₂O₃, ZrO₂, In₂O₃, and mixtures thereof; or

b) a platinum group metal free regenerable catalyst composition for entrapping SO_x comprising an oxide selected from the group consisting of praseodymia, zirconia-praseodymia and mixed manganese-yttria and mixtures thereof.

17. The vehicle exhaust system of claim 16 wherein the SO_x adsorbing material comprises a platinum group metal-free (PGM-free) regenerable catalyst composition for entrapping SO_x comprising a component having formula I;



wherein A oxide is selected from the group consisting of SiO₂, Zr-SiO₂, Al₂O₃, TiO₂-Al₂O₃, ZrO₂, In₂O₃, and mixtures thereof;

18. The vehicle exhaust system of claim 17 wherein the A oxide is selected from the group consisting of SiO₂, Zr-SiO₂, TiO₂-Al₂O₃, ZrO₂, In₂O₃, and mixtures thereof.

19. The vehicle exhaust system of claim 17 wherein the A oxide is selected from the group consisting of SiO₂, Zr-SiO₂, and mixtures thereof.

20. The vehicle exhaust system of claim 16 wherein the SO_x adsorbing material comprises an oxide selected from the group consisting of praseodymia, zirconia-praseodymia and mixed manganese-yttria, and mixtures thereof;

21. The vehicle exhaust system of claim 16 wherein the SO_x adsorbing component is a diesel oxidation catalyst.

5 22. The vehicle exhaust system of claim 16 wherein the SO_x adsorbing component is a catalyzed soot filter.